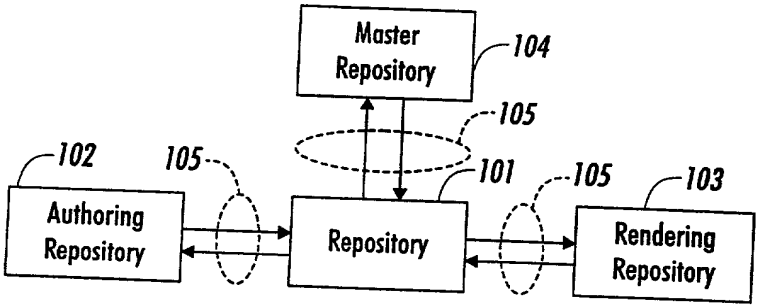

Master Repository
104
105
102
105
101
105
103
Authoring Repository
Repository
Rendering Repository

FIG. 1

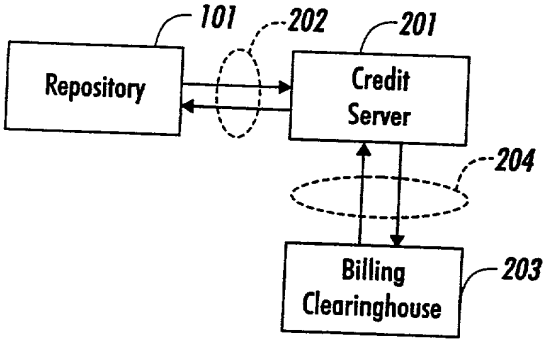

101
202
201
Repository
Credit Server
204
Billing Clearinghouse
203

FIG. 2

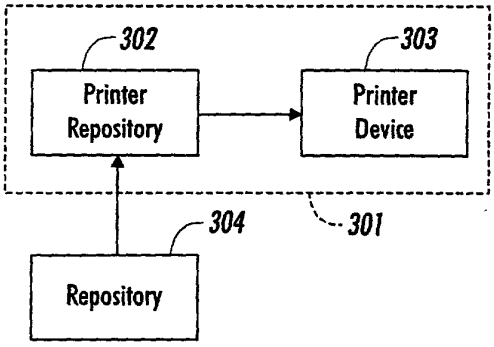

302
303
Printer Repository
Printer Device
304
301
Repository

FIG. 3

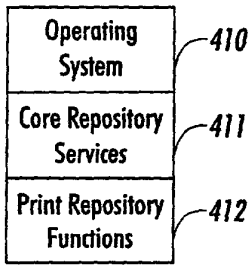

Operating System
410
Core Repository Services
411
Print Repository Functions
412

FIG. 4

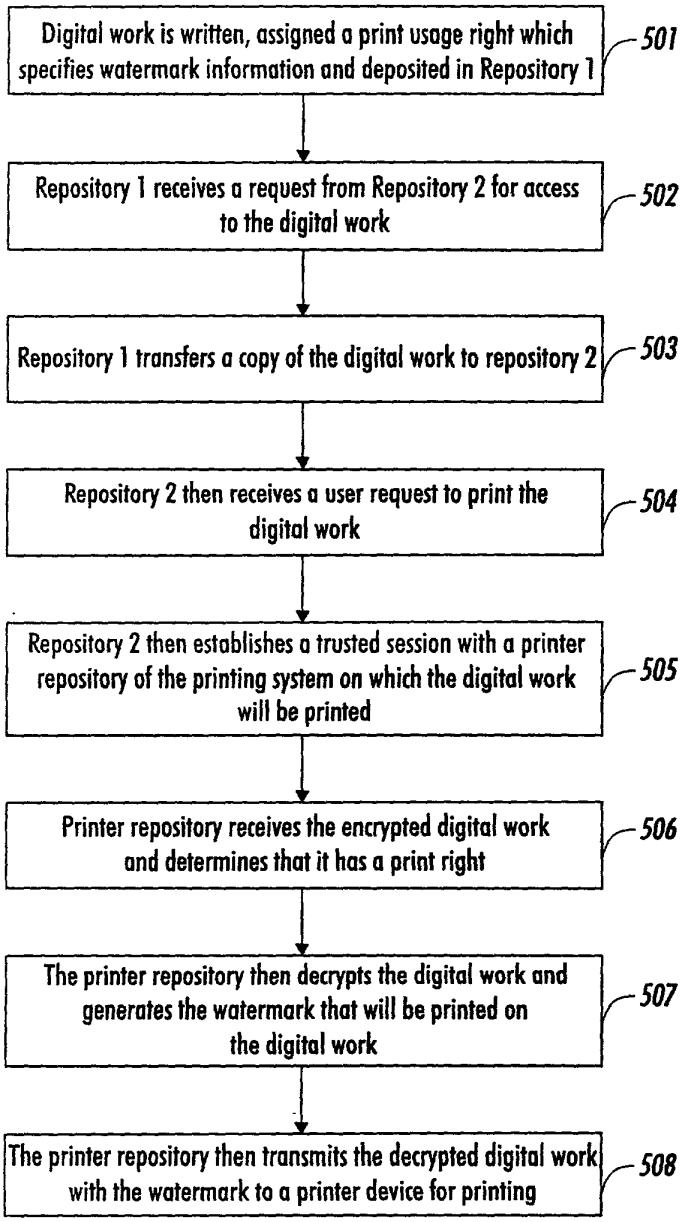

Digital work is written, assigned a print usage right which specifies watermark information and deposited in Repository 1
501
Repository 1 receives a request from Repository 2 for access to the digital work
502
Repository 1 transfers a copy of the digital work to repository 2
503
Repository 2 then receives a user request to print the digital work
504
Repository 2 then establishes a trusted session with a printer repository of the printing system on which the digital work will be printed
505
Printer repository receives the encrypted digital work and determines that it has a print right
506
The printer repository then decrypts the digital work and generates the watermark that will be printed on the digital work
507
The printer repository then transmits the decrypted digital work with the watermark to a printer device for printing
508

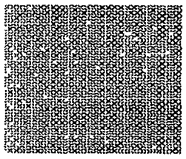
FIG. 5

```
(Work:
601 ~(Description: "Title:'The Moby Dog Story'
                    Copyright 1994 Zeke Jones")
602 ~(Work-ID: "Vanity-Press-Registry-lkjdf98734")
603 ~(Owner: "Zeke-Jones-ID12345-zxcvoiuyr")

604 ~(Rights-Group: "Regular"
      (Bundle:
605 ~  (Fee: (To:"Account-Jones-Pub24afdoui4398"))
606 ~  (Access: (Security-Level: 2)) )
607 ~(Copy: (Fee: (Per-Use: 5)))
608 ~(Transfer: )
609 ~(Delete: )
610 ~(Play: )
611 ~(Print:                                    614
                (Fee: (Ticket: "Jones-Prepaid-Print-9085oijgr4"))
                (Printer: "TrustedPrinter-6070-qoeiru45587") )
                (Watermark:                                  613
                        (Watermark-Str: "Title: Moby Dog Copyright 1994
                                         by Zeke Jones.
                                         All Rights Reserved.")
                        (Watermark-Tokens: user-id institution-location
                                           render-name render-location
                                           render-time) )))   } 616
                                    615
612 ~(Print:
                (Fee: (Per-Use: 10))
                (Printed: "TrustedPrinter-6070-qoeiru45587") ) ))
                (Watermark:                                  613
                        (Watermark-Str: "Title: Moby Dog Copyright 1994
                                by Zeke Jones.
                                         All Rights Reserved.")
                        (Watermark-Tokens: user-id institution-location
                                           render-name render-location
                                           render-time) )))   } 617
```

FIG. 6

```
(Work:
        (Description: "Title:'The Moby Dog Story'
                Copyright 1994 Zeke Jones")
        (Work-ID: "Vanity-Press-Registry-lkjdf98734")
        (Owner: "Zeke-Jones-ID12345-zxcvoiuyr")

        (Rights-Group: "Regular"
        (Bundle:
701 ~   (Fee: (To:"Account-Jones-Pub24afdoui4398"))
        (Access: (Security-Level: 2))
                                                        702
        (Copy: (Fee: (Per-Use: 5))
                (Access: (Destination-Authorization: "Jones-Distributor-9845kjh" )))
        (Transfer:      (Access:  (Destination-Authorization: "Jones-Distributor-9845kjh" ))))
        (Delete: )
                                                        703
        (Play: )
        (Print:
                (Fee: (Ticket: "Jones-Prepaid-Print-9085oijgr4"))
                (Printer: "TrustedPrinter-6070-qoeiru45587") )))
                (Watermark:
                        (Watermark-Str: "Title: Moby Dog Copyright 1994
                                        by Zeke Jones.
704                                     All Rights Reserved.")
                        (Watermark-Tokens: user-id institution-location
                                        render-name render-location
                                          render-time) )))
```

FIG. 7



803

Zeke Zack - The Moby Dog Story

Copyright 1994 Zeke Jones. ALL RIGHTS RESERVED

THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE. THIS IS A STORY ABOUT A DOG NAMED MOBY. HE WAS A BIG DOG THAT THOUGHT HE WAS A WHALE.

802

FIG. 8

Express Mail No. EV 035 376 525

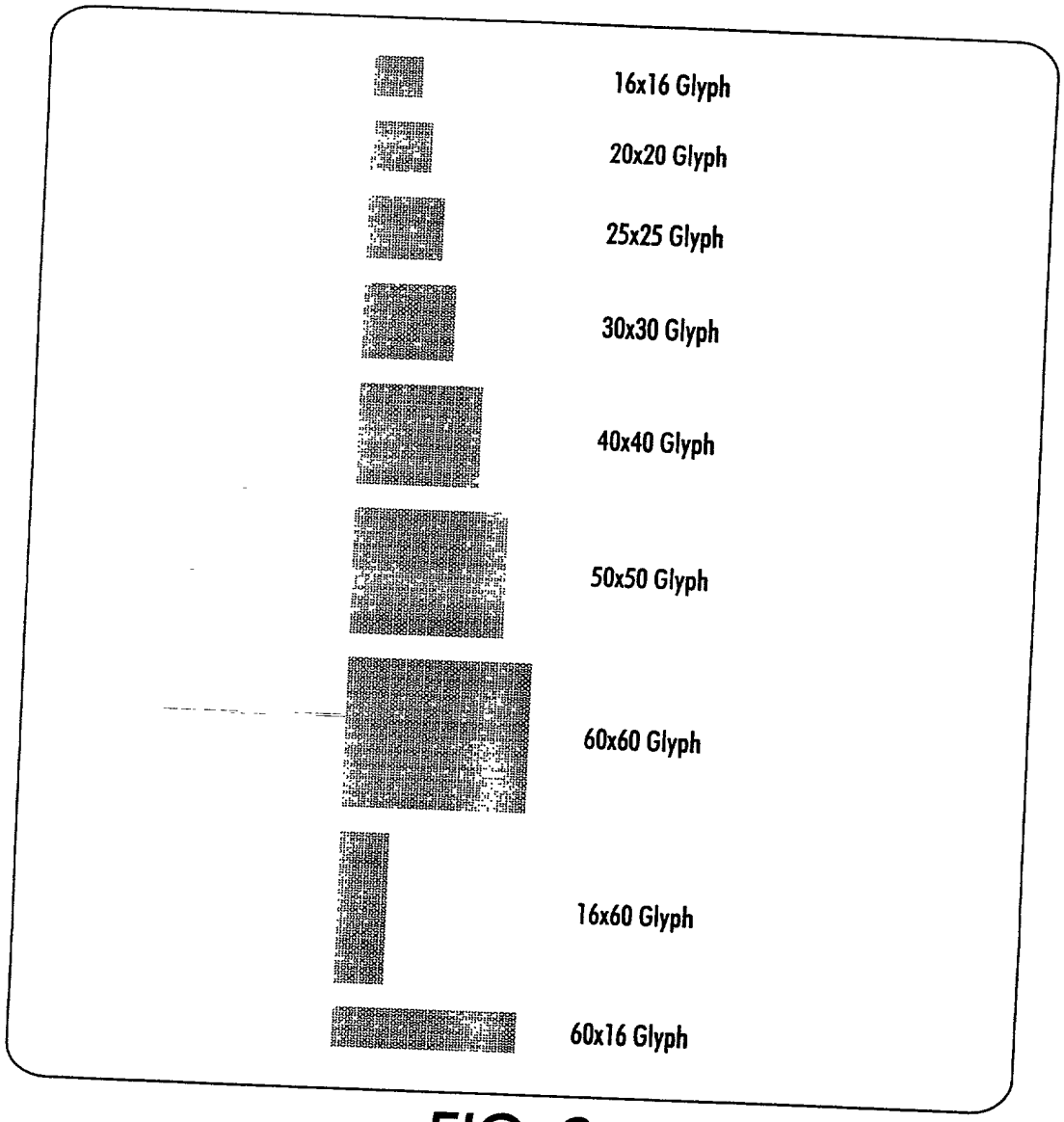

16x16 Glyph
20x20 Glyph
25x25 Glyph
30x30 Glyph
40x40 Glyph
50x50 Glyph
60x60 Glyph
16x60 Glyph
60x16 Glyph

FIG. 9

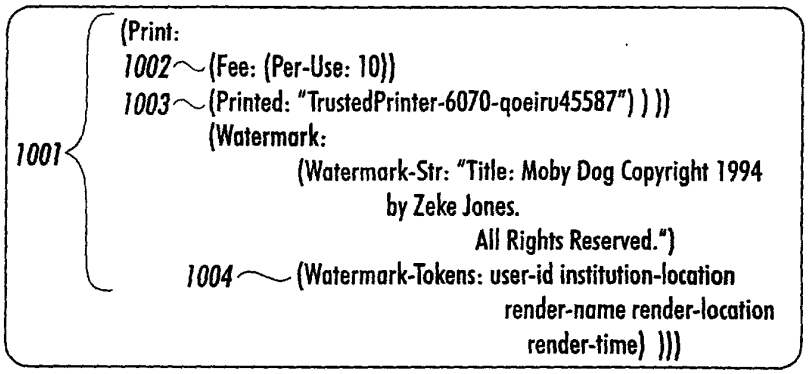

1001
(Print:
1002 (Fee: (Per-Use: 10))
1003 (Printed: "TrustedPrinter-6070-qoeiru45587"))))
(Watermark:
(Watermark-Str: "Title: Moby Dog Copyright 1994
by Zeke Jones.
All Rights Reserved.")
1004 (Watermark-Tokens: user-id institution-location
render-name render-location
render-time))))

FIG. 10

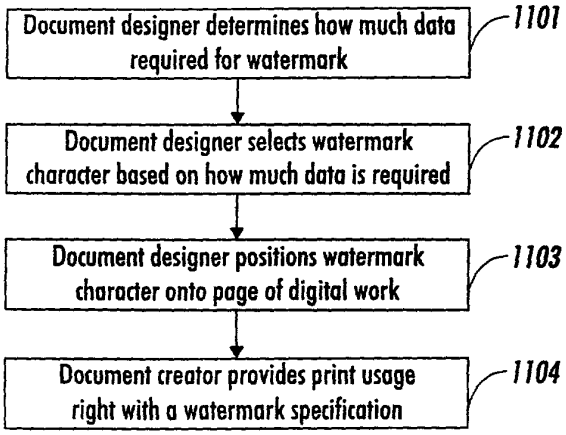

Document designer determines how much data required for watermark
1101
Document designer selects watermark character based on how much data is required
1102
Document designer positions watermark character onto page of digital work
1103
Document creator provides print usage right with a watermark specification
1104

FIG. 11

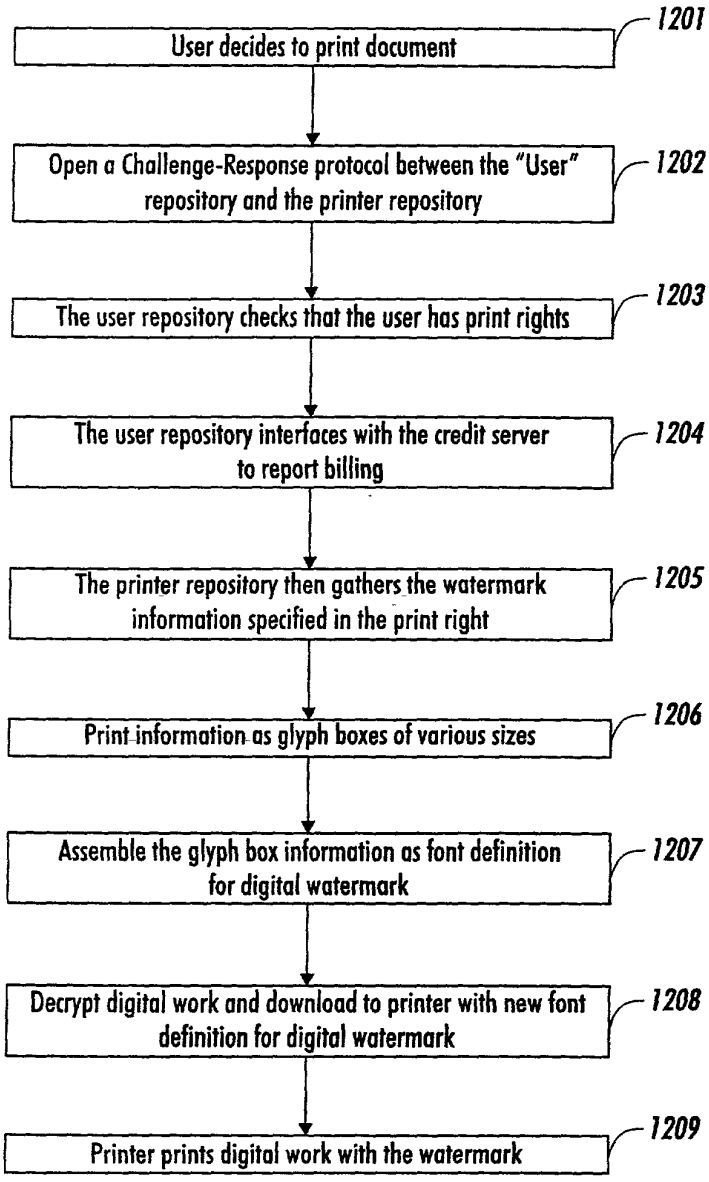

User decides to print document
1201
Open a Challenge-Response protocol between the "User" repository and the printer repository
1202
The user repository checks that the user has print rights
1203
The user repository interfaces with the credit server to report billing
1204
The printer repository then gathers the watermark information specified in the print right
1205
Print information as glyph boxes of various sizes
1206
Assemble the glyph box information as font definition for digital watermark
1207
Decrypt digital work and download to printer with new font definition for digital watermark
1208
Printer prints digital work with the watermark
1209

FIG. 12

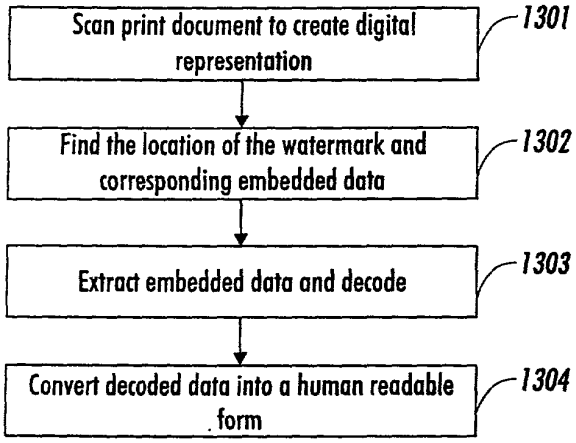

Scan print document to create digital representation
1301
Find the location of the watermark and corresponding embedded data
1302
Extract embedded data and decode
1303
Convert decoded data into a human readable form
1304

FIG. 13

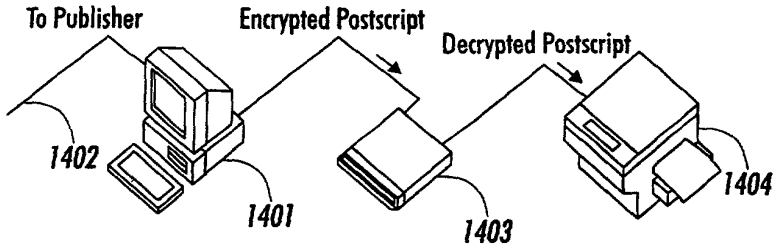

To Publisher
Encrypted Postscript
Decrypted Postscript
1402
1401
1403
1404

FIG. 14

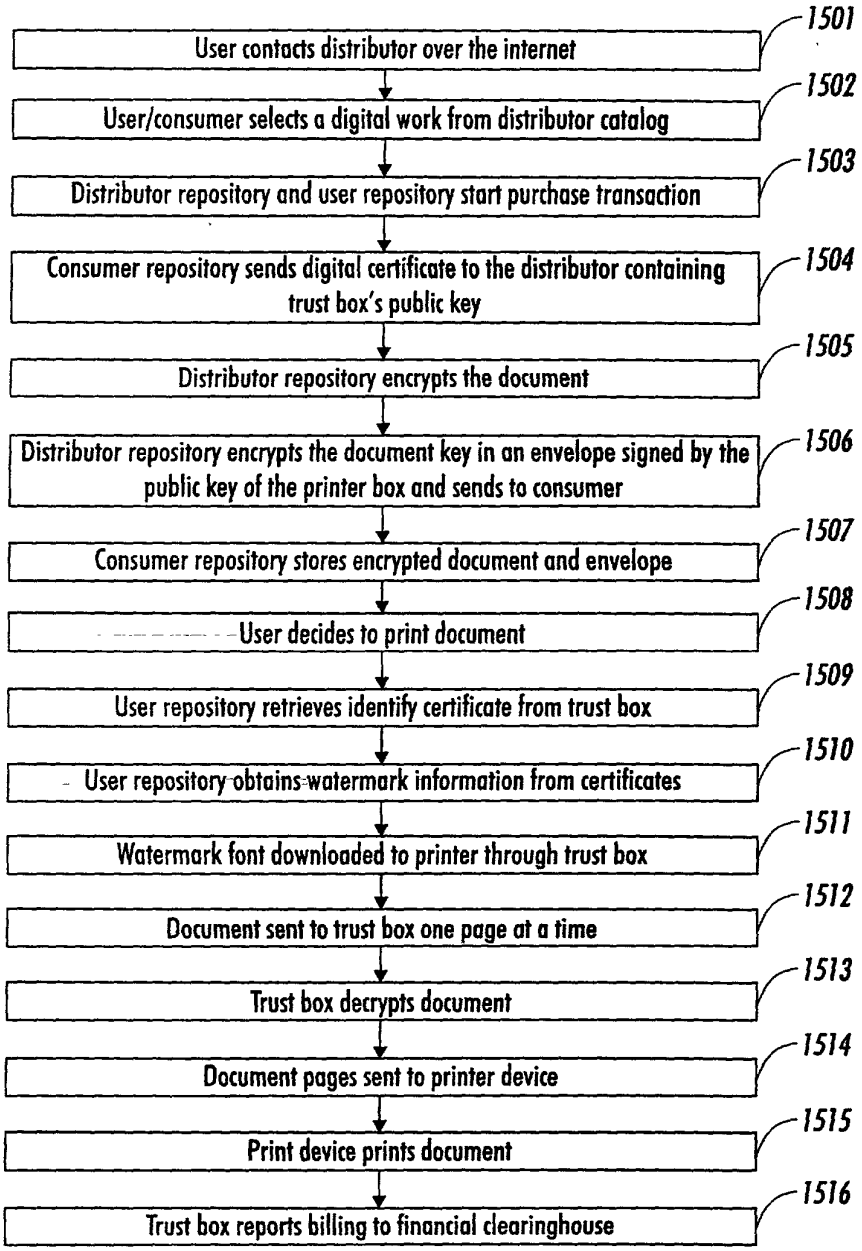

User contacts distributor over the internet
1501
User/consumer selects a digital work from distributor catalog
1502
Distributor repository and user repository start purchase transaction
1503
Consumer repository sends digital certificate to the distributor containing trust box's public key
1504
Distributor repository encrypts the document
1505
Distributor repository encrypts the document key in an envelope signed by the public key of the printer box and sends to consumer
1506
Consumer repository stores encrypted document and envelope
1507
User decides to print document
1508
User repository retrieves identify certificate from trust box
1509
User repository obtains watermark information from certificates
1510
Watermark font downloaded to printer through trust box
1511
Document sent to trust box one page at a time
1512
Trust box decrypts document
1513
Document pages sent to printer device
1514
Print device prints document
1515
Trust box reports billing to financial clearinghouse
1516

FIG. 15

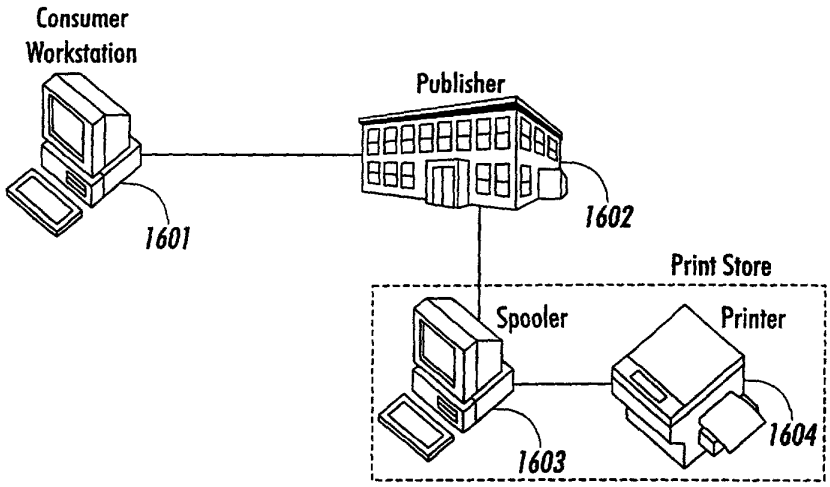

Consumer
Workstation
Publisher
1601
1602
Print Store
Spooler
Printer
1603
1604

FIG. 16

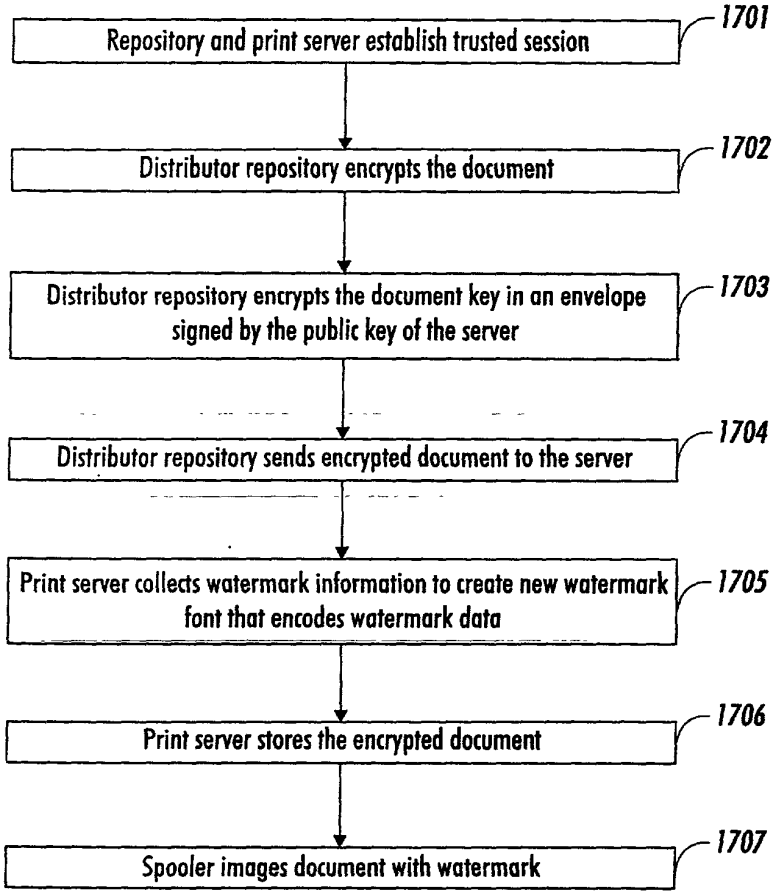

Repository and print server establish trusted session
1701
Distributor repository encrypts the document
1702
Distributor repository encrypts the document key in an envelope signed by the public key of the server
1703
Distributor repository sends encrypted document to the server
1704
Print server collects watermark information to create new watermark font that encodes watermark data
1705
Print server stores the encrypted document
1706
Spooler images document with watermark
1707

FIG. 17